Overcoming Range Limitations of LiDAR Systems in Littoral Contexts Attributable to Atmospheric Scattering of Light Utilizing Magneto-Tracer Rounds Coupled with Guided Ballistic Munitions for the Augmentation of Automated CIWS to Reduce Ammunition Use and Increase Effective Range

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Introduction

The effectiveness of modern CIWS is limited primarily by the effective range of the LiDAR that drives the targeting system for the cannon. It is secondarily limited by tendency of unguided (generally .50 caliber) munitions to drift unpredictably, a factor that requires that "walls of bullets" be used to assure that an incoming missile is interdicted.

Regardless of the density of these "walls of bullets," CIWS are limited in their range, with a sharp drop-off in effectiveness beyond 1.7 miles and virtually zero effectiveness beyond 1.9 miles. The longer the system must fire to terminate a single incoming target, the more "ground" can be gained by other approaching missiles in swarm attacks. Tertiary limitations on these systems include the quantity of ammunition that may be carried aboard a ship, how rapidly drums of ammunition may be swapped out under combat conditions use as well as limitations implied by the overheating of the system under high-use conditions.

If a CIWS could fire upon a target and be assured of a successful interdiction with a single round (or a single cluster of rounds) fired at the soonest possible time after the missile enters the range of the munitions, the time spent on each target would be substantially reduced and all of the aforementioned limitations upon CIWS would cease to exist.

Abstract

Rather than firing hundreds of rounds per minute, a novel CIWS might, upon the detection of incoming missiles, fire five bullets at the same moment not intended to strike the incoming missile, but rather, to aid in its triangulation and provide real-time guidance data to a single bullet following closely behind that is capable of steering to compensate for atmospheric influences (as are the magneto-tracer rounds.) While a bullet is too small to be equipped with its own internal LiDAR system, they may be powerfully magnetized in order to deliberately create a detectable effect upon its near passage to an incoming missile. The proximity of a magnetized round to a missile, with its metallic components, would result in a detectable slowing in the rotation of the round, with a small computer chip keeping track of rotational rate for the duration of the flight. These five 'forerunner' rounds would be, themselves, guided in real-time so that the incoming missile passes through a "ring" created by those rounds, which would fly in parallel. The extent to which each forerunner's rotational velocity is

hampered by near-passage to the incoming missile is used to inform the trailing "kill shot" as to how it needs to correct its flight in order to guarantee interception.

As mentioned in a previous publication, small, unguided munitions may be adapted as guided munitions through the controlled resonance of subsections of the skin of the munition designed to increase the surface area of the leading-edge of the munition. By switching a source of vibrational energy on and off repeatedly so that the same relative section (made necessary by the spin of the munitions) is alone in having increased surface area, the munition may be made to "steer" in a controlled fashion.

So long as the relative rotational position, rate, and rate of change of that rate may be internally tracked by the internal electronics within the munition and those munitions are interlinked by radio with one another (as well as the ship firing them,) six rounds would suffice to terminate any incoming missile while it is as far away as four miles, with the system not needing to confirm the kill before moving to the next target. Rather than, "Shoot, shoot, look," this system would operate on a principle of firing "kill shots" at each incoming missile and revisiting the first missile in the sequence only at the end of the sequence and only if necessary. As the system does not need to "dwell" on one target for protracted periods of time, it may terminate 6-8x the quantity of incoming tracks with a high degree of confidence relative to the pre-established SotA.

Conclusion

An enemy expecting to be able to overwhelm an existing system, if met by this system, would find their assault entirely ineffective and would, indeed, be met by strategic surprise.